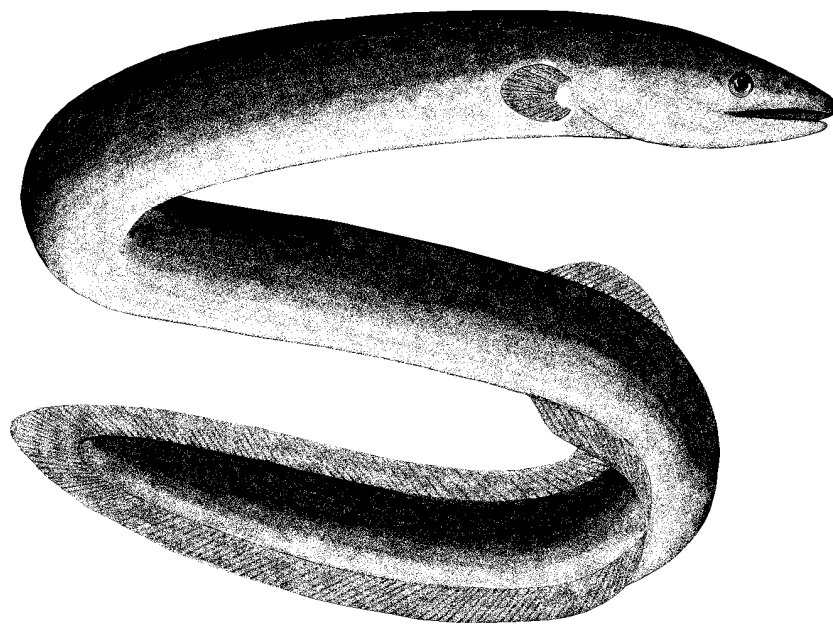


# **Assessing the ecological sustainability of the Tasmanian freshwater eel fishery**

**A report prepared for the Department of Environment  
and Heritage for the purposes of Part 13A of the  
*Environment Protection and Biodiversity  
Conservation Act 1999.***

**Phillip Boxall**



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**A report prepared for Environment Australia as required for assessment under  
guidelines for Schedule 4 listing under the *Wildlife Protection (Regulation of  
Exports and Imports) Act 1982***

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## **A INTRODUCTION**

### **A.1 Life History**

Two species of freshwater eel occur in Tasmania, the shortfinned eel (*Anguilla australis*) and the longfinned eel (*Anguilla reinhardtii*). The shortfinned eel is found in all waters of Tasmania, whereas the longfinned eel is restricted primarily to waters of the North East. Due to this, the shortfinned eel is the basis of the commercial fishery in Tasmania.

It is generally accepted throughout Australasia that both the shortfinned and longfinned eel species belong to single genetic stocks respectively. This in turn indicates that fishing mortality in one catchment does not necessarily affect the eel population within the catchment, given the random recruitment from the single stock(s).

It is believed both species spawn as adults in warm sub-tropical waters at depth near by which time they may be in excess of 16-20 years old. After spawning the adults die. There is some conjecture over the location of the exact spawning areas for *A. australis* and *A. reinhardtii*. Schmidt (1925) suggested the spawning areas of *A. australis* is in the Coral Sea, in the vicinity of New Caledonia. Castle (1963) suggests that the spawning ground for *A. australis* and *A. reinhardtii* lies between Fiji and Tahiti, the centre of which is 18°S and 170°W (Tesch 1977). Aoyama et al. (1999) also suggest this is the area in which *A. australis* spawns, while Jellyman (1987) proposed that the spawning ground for *A. australis* is in the vicinity of 5-15°S and 150-170°W, south east of the Solomon Islands. The evidence for the proposed locations of the spawning ground of these species is sparse.

Once hatched the eel larvae drift with ocean and coastal currents, dispersing along the Eastern Australian seaboard and into the Tasman Sea. As the larvae approach the Australian coast they metamorphose from a leaf shaped larva (leptocephali) into a transparent “glass eel”. These become pigmented juvenile eels or elvers after they enter estuaries.

### **A.2 History of the fishery**

The commercial fishery for eels in Tasmania commenced in the mid-1960's. Two species of freshwater eels occur Tasmania, the shortfinned eel (*Anguilla australis*) and longfinned eel (*Anguilla reinhardtii*). The shortfinned eel is the most prevalent representing over 97% of the commercial harvest.

In the early years of the fishery between three and 12 fishers were licensed by the Inland Fisheries Commission (IFC) (since a review held in 1998 the IFC is now known as the Inland Fisheries Service (IFS)). Early interest in the fishery came principally from interstate or overseas fishers, most of whom left the fishery in 1969 after an initial intense exploratory fishing effort.

The catch varied widely during the early stages of commercial fishing for eels but has stabilised during the last ten years. The harvest varied early due to a number of factors including:

- changes in the number of licensed fishers,
- changes in regulations (particularly during the 1960's and 1970's),
- fluctuations in recruitment for some major waters,
- changes in the waters fished by individual fishers.

Management of the fishery effectively commenced in 1965 when the first commercial eel fishers were licensed by the IFC. Regulations were imposed under the *Inland Fisheries Act 1959*. This Act introduced the first size limits and regulated the size, quantity and type of gear for conventional fyke and trap fishing.

Prior to 1968 access to the commercial eel fishery was not limited but after a review by the then Commissioner of the IFC Mr D. D. Lynch (Inland Fisheries Commission Report for the year ending 30 June 1968, Appendix 2) the IFC discouraged any further applicants for commercial eel licences and a restriction of 30 fyke nets per fisher was introduced.

The history of the commercial eel fishery and its management has been summarised below:

<b>Season</b>	<b>Regulatory/Policy Change</b>
1965-66	Commercial fishing for eels permitted using fyke nets and traps
1967-68	<p>Licence fee introduced - \$4, plus \$1 for each fyke net or trap after the first. Licence subject to IFC discretion in regard to:</p> <ul style="list-style-type: none"> <li>• duration,</li> <li>• times and places fished,</li> <li>• type and site of fyke nets/traps,</li> <li>• marking fyke nets/traps,</li> <li>• disposal of other fish, and</li> <li>• reports of catch.</li> </ul> <p>D. Lynch (Inland Fisheries Commission Report for the year ending 30 June 1968, Appendix 2) outlined IFC policy.</p>
1968-69	<p>Marking of fyke nets and traps regulated.</p> <p>Licence fee increased to \$50, plus \$1 per fyke net/eel trap thereafter.</p> <p>Restriction imposed:</p> <ul style="list-style-type: none"> <li>- fyke nets restricted to 30 per commercial fisher,</li> <li>- Lake Sorell, Dee Lagoon and Pawleena Dam closed to commercial eel fishing from 1 July to 31 December,</li> <li>- dimensions of fyke nets set (diameter 450mm, length <math>\leq</math> 4M, mesh 15-40mm, wings <math>\leq</math> 3M and drop <math>\leq</math> 600mm).</li> </ul> <p>IFC discourages further commercial eel licence applications.</p>
1969-70	<p>Legal minimum size of 12 inches (300mm) introduced.</p> <p>Ban on the export of live elvers.</p>

- 1970-71 Commercial eel fishing returns introduced with number of nets/traps and water(s) specified.
- 1972-73 Licence fee increased to \$100, plus \$1 per fyke net/trap thereafter. Licence numbers restricted to 13.
- 1973-74 Further restrictions introduced:
- (1) Fyke nets/traps to be spaced by  $\geq 20M$ ,
  - (2) Use of fyke nets and traps in combination banned,
  - (3) Fyke nets to be inspected and cleared at least every 24 hours,
  - (4) Use of non-licensed assistant fishers banned,
  - (5) Commercial fishing not permitted within 100M of a river mouth or within 25M from an entrance or outlet of a river, creek or drain flowing into or out of a lake or marsh,
  - (6) Use of nets in rivers no longer allowed.
- Dimensions of nets regulated (diameter 450mm, length  $\leq 4M$ , mesh 15-40mm, wings  $\leq 3M$  and drop  $\leq 600mm$ ).
- 1974-75 Fyke nets to be cleared every 12 hours.
- 1975-76 Fyke nets to be cleared every 24 hours.  
All prime trout waters closed to commercial eel fishing (ie. highland lakes stocked with trout).
- 1976-77 D. Lynch (Inland Fisheries Commission Report for the year ending 30 June 1977, Appendix II) reviewed the commercial eel fishery.
- 1977-78 Licence fee increased to \$100 plus \$2 per fyke net/trap thereafter.  
Number of fyke nets increased to 50.  
Assistant eel fishers licence introduced – fee \$5  
Net size increased (opening height  $\leq 670mm$ , width  $\leq 670mm$ , mesh 15-39mm, wings  $\leq 3M$  and drop  $\leq 670mm$ ).  
Trap size specified (height  $\leq 500mm$ , length  $\leq 2M$ , width  $\leq 500mm$ , mesh  $\geq 39mm$  and no wings or leaders).
- 1978-79 Eel traps limited to 50 and combination of traps and fyke nets limited to 50.  
Commercial eel fishery limited to ten licensees plus assistants.
- 1979-80 Licensee to be present when a fyke net/trap set or hauled.  
Waters to be fished allocated by municipality.
- 1980-81 Fyke net wings increased to  $\leq 10M$  and drop  $\leq 1.2M$   
Migrating eel licenses introduced – fee \$100.
- 1981-82 Fyke netting permitted on a trial basis in Trevallyn Dam.
- 1989-90 Feeding eel licence deregulated:
- By removing previous restrictions (1) and (5) imposed in 1973-74,

- By allowing the licensee not to be present when a fyke net/trap was set or hauled,
- By removing the restriction that no fyke net/trap should be set more than half way across the width or centre of a creek or watercourse.

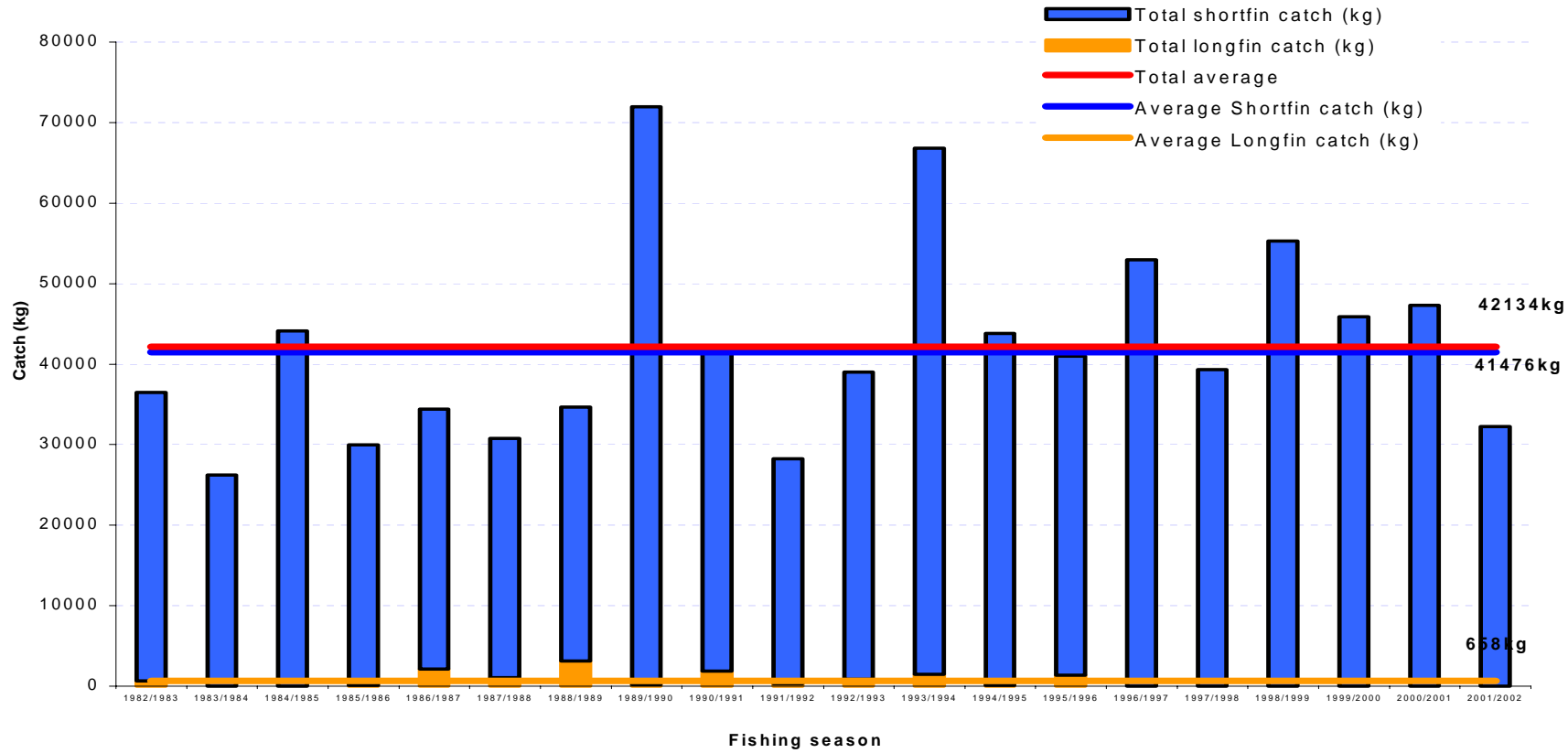
- 1990-91 Fees increased:
- For migrating eel licences to \$200, and
  - For feeding eel licences to \$200 plus \$3 per fyke net/trap thereafter.
- 1991-92 Moratorium on issuing of licences imposed pending management review.
- 1995-96 With the introduction of a new Act and Regulations (*Inland Fisheries Act 1995 & Inland Fisheries Regulations 1996*) after consultation with all commercial eel fishers a new system of licensing and management was introduced.
- Licences became transferable and boundaries were based on water catchment areas instead of municipality borders.
  - Migratory and feeding eel licenses were abolished and replaced with the one commercial fishing licence.
  - Relaxation of gear restrictions (the net dimensions remained the same, but no limit on the amount of nets used).
  - Strictly enforced logbook returns.
  - Royalty fee introduced (based on every kilogram of eel sold).
  - The rationale of this new system of management and licensing was to encourage self management of the eel resource by each individual licence holder.

### **A.3 The freshwater eel fishery today**

Tasmania's inland waters sustain twelve commercial licence holders able to target freshwater eel. Over the last ten years the average harvest of eel has been around 42 tonne per annum with shortfinned eels comprising 98% of this amount (Diagram 1). This is mainly due to Tasmania being at the southern extremity of the longfinned eel range. Longfinned eels occur across the North and East of the State in small numbers. They are only commercially targeted in one licence area. The fishery is affected greatly by seasonal factors with periods of drought greatly affecting the harvest. There is no Total Allowable Catch (TAC) set for the fishery.

Fishers are able to restock their waters with elvers and small eels. This mostly occurs in hydro-electric dams where natural recruitment of juvenile eels (elvers) is minimal due to dams acting as barriers to further migration.

**Figure 1. Tasmanian Eel Harvest (1982-2002)**



Most of the commercial harvest of freshwater eels comprises mainly of “yellow” feeding eels. Some “silver” migrating eels are also harvested but mainly in impoundments where their chance of escapement into the sea to spawn is minimal, due to the risks associated with their survival in passing through turbines or over dams. The IFS protects migrating eels in Rivers by protecting 99% of the States rivers from fyke netting.

All commercial fishing licences endorsed to harvest freshwater eels are comprised of water catchment areas thus avoiding any overlapping in fishing operations between licence holders. The State comprises 48 water catchments of which of which 38 are allocated to commercial licences. This was agreed by the Inland Fisheries Service (IFS) and Industry after consultation and is seen as encouraging more self management by fishers. Fishers are required to secure permission from landowners if they wish to fish on private water bodies. Fishers are able to fish in public waters as long as the waters are endorsed on their licence. Some public waters are not fished to avoid any recreational/commercial fisher conflict.

All waters within World Heritage areas, National Parks and State Reserves are excluded from any commercial eel fishing operation. Eels can only be taken by fyke nets and eel traps. Fyke netting is only permitted in a limited number of rivers. Less than 1% of the State’s Rivers and Streams are permitted to be commercially fished with fyke nets. This is mainly permitted to those licence holders who do not possess large impoundments within their water catchment areas.

The interpretation of a fyke net is defined under the *Inland Fisheries (Commercial Nets and Fees) Regulations 1999*.

Fyke net means a net –

- (a) that does not exceed 670 millimetres in opening height; and
- (b) that does not exceed 670 millimetres in width; and
- (c) that has mesh that is not less than 15 millimetres and not more than 39 millimetres; and
- (d) any wing or leader of which does not exceed 10 metres in length and does not exceed 1200 millimetres in drop.

The interpretation of an eel trap is defined under the *Inland Fisheries (Recreational Fishing) Regulations 1999*.

Eel trap means a trap that –

- (a) does not exceed 500 millimetres in height; and
- (b) does not exceed 2 metres in length; and
- (c) does not exceed 500 millimetres in width; and
- (d) does not have any wings or leaders; and
- (e) has a mesh of at least 39 millimetres.

Some commercial eel fishers are permitted to use fyke nets with different dimensions when targeting eels in specific locations (ie in deep water near intake towers on hydro-electric dams).

All commercial fishing equipment must be clearly labelled with an identification tag supplied by the IFS and be checked and cleared every 24 hours. Every fyke net and eel trap must contain an approved screen to avoid incidental bycatch. Some fishers have exemptions for certain approved waters enabling them to use fyke nets with larger screens so long as the codends of the fyke nets are raised at least 300 millimetres clear of the water surface.

All eels measuring less than 300mm in length must be immediately returned to the water from which they were taken. Eels must not be translocated into public waters without the prior written approval of the IFS.

There is minimal information on the recreational pressure on eel stocks in Tasmania. Anecdotal evidence suggests that the recreational harvest is small. Legislation was approved in 2003 to place limits on the recreational take of freshwater eels. The limits are as follows:

- Bag limit – 12 eels
- Possession limit – 24 eels
- Size limit – 300 millimetres

Recreational eel fishing is permitted in all waters open to recreational angling.

Before Hydroelectric impoundment's were built in Tasmania freshwater eels were able to navigate to most waters in Tasmania. During the warmer months juvenile freshwater eels (elvers) have a natural urge to migrate. Where dams are present they accumulate at the base as they are unable to ascend the dam wall. The IFS has identified the Trevallyn tailrace (Tamar River) and Meadowbank Dam (Derwent River) as two major locations where elvers accumulate annually. Juvenile eels are harvested from these areas each year and offered to commercial fishers as stock for waters that receive minimal natural recruitment due to barriers so that environmental, commercial and conservational values are maintained. Elvers are also offered to fish farmers and licensed eel fishers on mainland States. Harvested elvers are also released in waters upstream of man-made barriers at the discretion of the IFS to maintain conservational and biological values of the water(s).

If elvers were not harvested from these locations they would most probably perish and be lost to the fishery. If the IFS did not annually harvest these migrating elver, in excess of 2,500,000 juvenile eels would be lost (ie die) each year. When elvers are moved interstate (eg as restock for Victoria's eel fishery) all state translocation policies and protocols are met prior to shipment of the elver.

There has been interest over the years in exploiting glass eels in the State. Due to the large numbers of elvers the State has one can expect large numbers of glass eel. The IFS has for a number of years been involved in assessing the glass eel resource in Tasmania. To date the IFS has been unable to secure commercial quantities and as a

result concentrates ion harvesting stranded elver. The IFS has issued permits in the past to persons wishing to harvest glass eel, these ventures have not yielded viable quantities of glass eel. The IFS is able to issue permits for persons wishing to capture glass eel under the *Inland Fisheries Act 1995*.

Tasmania possesses world class recreational trout fisheries. Freshwater eels co-exist well with introduced salmonid species such as brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*). Some of Tasmania's "trophy" waters support large populations of eels.

#### **A.4 Conformity with Environment Australia's Assessment criteria**

To satisfy the Commonwealth Government requirements for a demonstrably ecologically sustainable fishery, the eel fishery must operate under a management regime that meets Principles 1 and 2 of Environment Australia's guidelines for ecologically sustainable fisheries management under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*. The management regime must take into account arrangements in other jurisdictions, and adhere to arrangements established under Australian laws and international agreements.

The Australian and New Zealand Eel Reference Group (ANZERG) was established in 1997 under the then Standing Committee on Fisheries and Aquaculture (SCFA). The original Terms of Reference for ANZERG were:

- Develop a coordinated approach to eel management
- Develop strategies for:
- Stock allocation
- Management & administration of the glass eel fishing sector
- Eel industry development (collaboration with aquaculture committee)
- Compliance (collaboration with compliance committee)
- Promote cooperative research on eels between States
- Advise on management policies to assist the promotion and enhancement of the eel aquaculture industry
- Facilitate communication between eel fisheries management, aquaculture management and research staff

Membership includes all Australian States plus New Zealand, consisting of one eel aquaculture representative (government) and one eel fisheries representative (government) person per State.

Over the last three years ANZERG has met infrequently, however a number of key recommendations from the most recent meeting (12<sup>th</sup> July 2002) was to re-establish ANZERG with the Australian Fisheries Management Forum (AFMF), meet annually and to utilise ANZERG as a vehicle for the assessment of all eel fisheries against the ESD criteria of the EPBC Act (1999).

The key role of ANZERG is to develop a coordinated approach to eel management throughout the region, and to provide direction for all relevant jurisdictions for

consistency in the management of eel stocks and the ecologically sustainable development of eel fishing and aquaculture industries. ANZERG is also the appropriate body to ensure the conservation and management of eels as “straddling stocks” in the South Pacific region. Such an arrangement is in accordance with The United Nations Agreement for the “Implementation of the Provisions of the United Nations Convention on the Law of the Sea of December 10, 1982, Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks” to which Australia is signatory. The objective of this Agreement is to ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks beyond areas under national jurisdiction through effective implementation of the relevant provisions of the Convention.

As per the guidelines the management regime does not have to be a formal statutory management plan as such, and may include non-statutory management arrangements or management policies and programs. The regime should:

- be documented, publicly available and transparent;

The Tasmanian freshwater eel fishery is managed under the *Inland Fisheries Act 1995* and *Inland Fisheries Regulations 1996*. The main policies in regards to the freshwater commercial eel fishery in Tasmania are contained within the IFS website at [www.ifc.tas.gov.au](http://www.ifc.tas.gov.au). Current management and policies applying to the eel industry are formulated to ensure that the eel industry is managed on a sustainable basis.

- be developed through a consultative process providing opportunity to all interested and affected parties, including the general public;

Management of the Tasmanian commercial eel fishery is through a consultative process. This includes consulting with other government Departments such as the Department of Primary Industries, Water and Environment (DPIWE), the Tasmania Professional Eel Fishers Association (TPEFA), the Inland Fisheries Advisory Council (IFAC) and the IFS before any management or policy decisions are approved.

- ensure that a range of expertise and community interests are involved in individual fishery management committees and during the stock assessment process;

The management of the freshwater eel industry in Tasmania is the responsibility of the IFS. The IFS seeks advice from IFAC.

IFAC is established under the provisions of Section 20A of the *Inland Fisheries Act 1995* and is the peak advisory body for matters relevant to the functions of the IFS. Broadly stated, the role of IFAC is to provide strategic advice to the Minister on all aspects of freshwater fisheries management and fishing policy.

IFAC is comprised of representatives with knowledge and experience in commercial fishing, fish processing, fish marketing, recreational fishing, aquaculture, conservation

of freshwater ecosystems and tourism. These representatives are from non-government organisations (NGO's).

ANZERG's role includes developing a coordinated approach to eel management across Australasia, thereby ensuring consistent management practices. With ANZERG being reformed, management of the eel industry in Tasmania will be discussed with ANZERG and any applicable directives from ANZERG will be incorporated where appropriate into the management of the Tasmanian freshwater commercial eel fishery.

- be strategic, containing objectives and performance criteria by which the effectiveness of the management arrangements are measured;

The IFS manages the Tasmanian commercial eel fishery to ensure sustainable harvests of eel. The IFS has detailed fisher returns dating back to 1966, which were greatly improved in 1996 (refer to Principle 1.1.4). All commercially fished public waters are identified through a Geographic Information System (GIS), MapInfo database. All commercial eel fishers submit catch effort data monthly, which aids in monitoring fishery production by individual waters and catchments.

As a rule the "Precautionary Principle" is practiced in the management of Tasmania's commercial eel fishery. The majority of eels targeted by commercial eel fishers in Tasmania is in man-made impoundments using fyke nets. Most of the states rivers and streams are closed to commercial fyke netting for eel, less than 1% of the States rivers and streams are commercially fished with fyke nets. Fishers are able to fish some rivers with eel traps but the level of effort using this method is very small. Over the last five years only one commercial eel fisher has actively utilised eel traps, mainly in one southern river. This regulated fishing ensures that recruitment overfishing does not occur.

All commercial eel fishers are required as condition of licence to correctly fill out catch returns for each days fishing. This detailed reporting allows the IFS to closely monitor production from individual waters and water catchment areas, thus allowing the IFS to detect and react to any dramatic changes in the fishery.

- be capable of controlling the level of harvest in the fishery using input and/or output controls;

The commercial eel industry in Tasmania is governed by the *Inland Fisheries Act 1995* and *Inland Fisheries Regulations 1996*. The commercial eel fishery is a closed fishery with the IFS being able to enforce restrictions on effort, gear design and use and waters open to commercial fishing.

- contain the means of enforcing critical aspects of the management arrangements;

Fisheries Officers have the power to enforce the *Inland Fisheries Act 1995* and *Inland Fisheries Regulations 1996*. The IFS enforces conditions created under the *Inland Fisheries Act 1995* and *Inland Fisheries Regulations 1996*, by way of Inspections of fishing operations by Fisheries Officers to ensure full compliance with all fishing conditions. The IFS currently has ten Fisheries Officers.

Fisheries Officers conduct random checks on commercial eel fishers. This includes physical checks on the fishing activity and fishing return checks. This would account for approximately 18 checks per annum. The level of compliance is high with only two prosecutions in the last 15 years.

- provide for the periodic review of the performance of the fishery management arrangements and the management strategies, objectives and criteria;

The IFS reviews annually the performance of the commercial eel fishery in Tasmania. In reviewing the fishery all management strategies/policies and objectives are reviewed. This is in conjunction with stakeholders such as IFAC and the TPEFA. The IFS has the power to refine the management of the fishery should any assessments of the fishery recommend change to the management.

- be capable of assessing, monitoring and avoiding, remedying or mitigating any adverse impacts on the wider marine ecosystem in which the target species lives and the fishery operates; and

Environmental impacts of activities undertaken as part of the fishery are considered minimal based on the passiveness of the equipment utilised. Potential impacts may include translocation of non-endemic fish species, damage to riverine habitats, riparian and instream vegetation, and disturbance of the substrate and river banks due to deployment and retrieval of gear and the use of four-wheel-drive vehicles, boats, and water pollution due to the operation of outboard motors. Fisheries officers monitor commercial eel fishery activities. This is by way of randomly inspecting fishing operations, catch and equipment to ensure that all conditions of licence are being met by fishers. This monitoring helps enable a comprehensive assessment on the impacts of commercial fishing operations, including bycatch monitoring and any translocation issues.

- require compliance with relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy.

The IFS is committed to complying with the National Policy on Fisheries Bycatch. The IFS has conducted bycatch reduction trials on a number of fyke net designs to reduce the incidental capture of bycatch. During 2001 the IFS in conjunction with the TPEFA and the Animal Ethics Committee aligned with the Department of Primary Industries, Water and Environment (DPIWE) agreed on set protocols that all

commercial eel fishers have to adhere to in order to reduce the risk of incidental bycatch. This includes all equipment having excluder screens and in approved cases all codends to be raised at least 300mm above the water surface.

## **B ESD ASSESSMENT**

### **B.1 PRINCIPLE 1.**

**A fishery must be conducted in a manner that does not lead to over-fishing, or for those stocks that are over-fished, the fishery must be conducted such that there is a high degree of probability the stock(s) will recover.**

#### ***B.1.1 Objective 1.***

**The fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability.**

#### ***B.1.1.1 Information requirements***

***1.1.1 There is a reliable information collection system in place appropriate to the scale of the fishery. The level of data collection should be based upon an appropriate mix of fishery independent and dependent research and monitoring.***

Information for assessing the freshwater eel fishery is collected from a number of sources, both fishery dependent and fishery independent.

The fishers are required to complete a daily catch logbook (attachment 1). This daily logbook book must be completed each day and requires fishers to provide: the water catchment number; name of the water body; gear code; the number of gear; number of hours the gear was set for; species code; feeding or migrating; the amount (in kilograms) released; total caught (in kilograms); amount transferred (in kilograms); name of water body transferred to and amount held (in kilograms) for sale. The catch return must be sent to the IFS by the 15<sup>th</sup> day of the following month. The current daily catch logbook has been in place since 1996.

The catch sold information is compared with fish dealer's returns. Returns from the fish dealers have been approximately 5% less than the recorded catch sold from the fishers returns. This difference is explained by the fishers holding their

catch until a commercial quantity is caught (this can take up to four weeks), the harvested eels lose weight while being held.

It is the view of the IFS that the data is reliable and very meaningful. The penalties associated with under declaring the landed catch on the fishing returns are a significant deterrent to under reporting. The majority of fishers catch records match their total sales. These two facts provide the IFS with a high degree of confidence in the data provided.

The IFS follows up discrepancies in the catch returns with the fisher at the time of data entry, which is generally within 7 days of receipt of the catch return.

Fishery independent information is not undertaken routinely due to the small size of the Tasmanian freshwater eel fishery and its small contribution to the Tasmanian economy. There have, however, been a number of projects examining eel populations around the State, including glass eel resource assessment and assessment of juvenile eel stocking practices (FRDC Project No. 2000/186), species distribution and ecology. One of the main recommendations is for continued restocking of elver above hydro electric impoundment's. This report has helped the IFS secure annual funding from Hydro Tasmania to harvest, grade and translocate elver statewide in order to maintain eel stocks.

As yet, there is no specific long-term, fishery independent monitoring been undertaken. The IFS does, however, conduct statewide distribution surveys on all freshwater ecosystems whereby eel data is collected and recorded. These surveys utilise standard freshwater sampling tools such as electroshocking, netting (gill and fyke netting), and setting stationary traps in all habitat types.

#### ***B.1.1.2-5 Assessment***

***1.1.2*** *There is a robust assessment of the dynamics and status of the species/fishery and periodic review of the process and the data collected. Assessment should include a process to identify any reduction in biological diversity and /or reproductive capacity. Review should take place at regular intervals but at least every three years.*

Fishery dependent data is collected from each licence holder as a condition of licence. Conducting a stock assessment on Tasmanian eel stocks would be very difficult to achieve as eels are very different to most other fish species. Eel population dynamics differ from other fish species dynamics in that they:

- are catadromous (migrate from freshwater to the sea to spawn)
- have a relative low natural mortality rate
- are environmental sex determination
- are presumed to be a panmixis stock
- have late maturation
- die after spawning.

Like eel fisheries in other States of Australia performance of the Tasmanian eel fishery is greatly affected by environmental factors, especially drought conditions.

The activities of the Tasmanian commercial eel fishery would only have a limited effect on the species reproductive capacity as adult eels found in the States rivers and streams (less than 1% of the States rivers and streams are commercially fished with fyke nets) are able to migrate and spawn, thus helping to supply recruits to the fishery. The largest eel fisheries in the world such as Europe, America and Asia still do not have a robust estimate of the spawning biomass.

The IFS annually assesses all catch statistics from each licence holder to ascertain the level of catch per unit effort (CPUE) to use as a guide as to the status of the fishery within these licence areas. The IFS also samples eels from the around the State taking basic biological information for reference and age. Should it be determined that an area needs to be protected and or regulated from commercial fishing then the IFS has the power to enforce this under the *Inland Fisheries Act 1995* and *Inland Fisheries Regulations 1996*. An area would be protected (by way of closure or effort or harvest restrictions) if there were any detrimental impacts caused by the fishing operations on any endangered species, or the level of take was considered too high (not sustainable with the level of recruitment).

*1.1.3 The distribution and spatial structure of the stock(s) has been established and factored into management responses.*

The distribution of shortfinned and longfinned eel is well known in Tasmania. Fishery dependent catch returns are a condition of licence and are quantified by allocated water and/or stock enhanced water fished. All public waters commercially fished for eels are incorporated into a GIS linked database. This allows more accurate reporting of catch by water, improved monitoring of eel stocks and management of the fishery on a catchment/water basis.

Reproduction of both shortfinned and longfinned eel is believed to occur in oceanic areas, and recruitment to freshwater habitats is random. It is presently assumed that both shortfinned and longfinned eels belong to panmictic stocks respectively. Thus biological diversity and reproductive capacity are unlikely to be affected by the level of fishing pressure in individual fresh waters. In addition, the protection of both immigrating glass eel stocks and emigrating adult eel stocks in defined closed waters and catchments is expected to contribute significantly to the sustainability of eel resources in Tasmania. Less than 1% of Tasmania's rivers and streams are commercially fished with fyke nets. Approximately 50% of the remaining 99% of closed rivers and streams are in an unmodified state. No estimates of the relationship between spawning stock biomass (SSB) and recruitment have been established for Tasmanian eel populations.

*1.1.4 There are reliable estimates of all removals, including commercial (landings and discards), recreational and indigenous, from the fished stock. These*

*estimates have been factored into stock assessments and target species catch levels.*

The IFS has been collecting catch statistics for the Tasmanian commercial eel fishery since 1966. There is, however, very limited information on the level of recreational and indigenous harvest of freshwater eels. From field observations made by Fisheries Officers the recreational angling pressure is thought to be very low. Fisheries Officer's guesstimate that the harvest is less than 2000 kilograms per annum.

Freshwater eels are not considered to be an important recreational species targeted by recreational anglers in Tasmania. Most recreational anglers in Tasmania target primarily brown and rainbow trout.

The level of indigenous people targeting freshwater eels is unknown. There are records of indigenous people targeting freshwater eels before European settlement, but the extent of this is not fully known.

Management of the recreational fishery is managed by size, bag and possession limits. The size limit is 300mm in length, a bag limit of 12 eels per day and a possession limit of 24 eels. Recreational eel fishing is permitted in waters where bait fishing is permitted, eels may only be taken recreationally on a rod and line or bush pole (a bush pole is defined under the *Inland Fisheries Regulations 1999*, as a length of wood that is not less than one metre in length; and does not have a reel and running line.)

***1.1.5 There is a sound estimate of the potential productivity of the fished stock/s and the proportion that could be harvested.***

It is believed that freshwater eels from around Australasia form a single breeding population. At present in Tasmania less than 1% of the State's rivers and streams are commercially fished with fyke nets. This protection of the stock should help ensure that the eels residing in rivers and streams not commercially fished will effectively maintain the eel spawning biomass.

Juvenile eels are made available to commercial eel fishers for stock enhancement in selected waters throughout the State. Accurate records are maintained on those waters, which receive stock enhancement to ensure sustainable harvests. Eels are very slow growing in Tasmania, with small eels (one gram) taking up to 15-20 years to reach one kilogram (FRDC Project No. 2000/186).

***B.1.1.6-9 Management responses***

***1.1.6 There are reference points (target and/or limit), that trigger management actions including a biological bottom line and/or a catch or effort upper limit beyond which the stock should not be taken.***

In order to generate reference points one has to assume there is a relationship between spawning stock and recruitment. Most reference points require information on population parameters including age structure, natural mortality, growth, spawning stock size and recruitment size. There is a lack of knowledge of these parameters and a thorough understanding of population dynamics of both the shortfinned and longfinned eel, which is consequently a major impediment in the development of specific reference points for eel stocks. The mechanisms determining sex differentiation of eels are uncertain, but may include growth rate, density, temperature, or a combination of factors. It is unclear exactly how recruitment to freshwater occurs and whether there are regional stock and recruitment linkages, or whether the assumption of panmixia in both species is correct. Natural mortality rates would be expected to vary with age and are likely to be high for the early life stages and decrease with age and size (which is common with most fish species). Furthermore, there is little or no quantitative information on carrying capacity of habitat types for eels or indeed what habitat variables determine carrying capacity.

Due to a lack of information on such data the “Precautionary Approach” has been adopted in managing the Tasmanian eel fishery and includes restricting the number of rivers open to eel fishing, and encouraging stock enhancement in the fishery in appropriate waters. The Precautionary Approach allows for sufficient escapement of spawning stock in order to allow for sufficient recruitment of juvenile’s back into the fishery.

Should the catch rates decline dramatically the IFS has the power under the *Inland Fisheries Act 1995* and *Inland Fisheries Regulations 1996* to regulate the amount of effort generated in the fishery as a means of protecting the remaining stock. This would occur should the same level of effort result in significant decreased harvests. Any change in management will involve the input of representatives of key stakeholder groups.

The IFS undertakes random sampling of eel populations around the State which helps address both population biology and management, in line with ANZERG’s recommendations for eel R&D on a regional scale. This enables the IFS to gauge the status of the stocks, albeit with a small amount of effort. The greatest impediment for undertaking more intensive eel research is the provision of funding for such a small-scale fishery.

*1.1.7 There are management strategies in place capable of controlling the level of take.*

The IFS has the power to control the level of take of freshwater eels in Tasmania constituted under the *Inland Fisheries Act 1995* and *Inland Fisheries Regulations 1996*. There are 12 licensed eel fishers in Tasmania, all renewed on an annual basis with the fishery managed as a closed fishery. Waters licensed to commercially fish are listed on each licence. In order to help protect stocks less than 1% of the State’s rivers and streams are commercially fished with fyke nets.

Some licence holders have variations to use fyke nets of differing dimensions to those allowed under the *Inland Fisheries Act 1995* and *Inland Fisheries Regulations 1996*. These variations are for particular waters where different designs are utilised due to the water fished (ie deep water). Fishers can apply for variations, which are, assessed by the IFS, in this assessment the main criteria for approval is that no other species will be impacted on. All waters within World Heritage areas, National Parks and State Reserves are also protected from any commercial eel fishing in Tasmania.

The Tasmanian freshwater eel fishery is managed under the “Precautionary Principle.” In order to help protect stocks to avoid recruitment overfishing less than 1% of the State’s rivers and streams are commercially fished with fyke nets.

The freshwater commercial eel fishery in Tasmania is managed utilising input controls including access to waters to be commercially fished for freshwater eels and gear restrictions.

All commercial eel fishing licences contain the following generic conditions constituted under the *Inland Fisheries Act 1995* and *Inland Fisheries Regulations 1996*:

- Prior to undertaking fishing authorised under this licence, the licence holder must gain all access approvals necessary from private land owners, water authorities and other water custodians, including the Department of Primary Industries, Water and Environment, and the National Parks and Wildlife Service.
- Eels may not be taken from any other waters of the State, nor by any other means, other than those specified in this licence.
- Eels may only be only be taken by means of fyke nets and eel traps, with fyke nets prohibited for use in flowing waters unless otherwise stated in the licence.
- Each fyke net and each eel trap shall be in accordance with the *Inland Fisheries Act 1995* or Regulations or Orders made thereunder unless otherwise stated in the licence.
- Each fyke net and each eel trap shall be securely fitted at all times with a screen with no individual opening having a perimeter exceeding 220mm covering the opening of the fyke net or eel trap.
- Each fyke net and each eel trap shall be securely fitted at all times with an individually numbered identification tag supplied by the Inland Fisheries Service.
- The licence holder shall notify officers of the Inland Fisheries Service within 24 hours of a fyke net or eel trap being lost or stolen stating the identification number of the fyke net or eel trap.

- The licence holder shall cause each fyke net and each eel trap to be inspected at least once in every 24 hours and shall cause to be removed from each fyke net or eel trap all fish contained therein upon such inspection.
- All eels measuring less than 300mm in length must be immediately returned to the water from which they were taken.
- Only eels exceeding 300mm in length may be retained for commercial purposes.
- All fish (other than eels over 300mm in length, redfin perch, tench and carp) found within a fyke net or eel trap must be returned to the water unharmed.
- In the event that carp are captured, the Inland Fisheries Service is to be notified and all carp are to be retained for collection by an officer of the Inland Fisheries Service.
- Eels must not be translocated into public waters without the prior written approval of the Inland Fisheries Service.
- The licence holder must maintain complete and accurate records of daily fishing activities in accordance with the prescribed logbook issued under Section 35 of the *Inland Fisheries Act 1995* and make such records available to an officer of the Inland Fisheries Service upon request.
- The licence holder shall, within 15 days after the expiration of every calendar month, lodge with the Director of the Inland Fisheries Service complete and correct monthly logbook returns in accordance with Section 35 (1) of the *Inland Fisheries Act 1995*, including “nil” returns, and including returns for any licensed assistant fisher endorsed under this licence.
- The licence holder shall provide evidence to verify the person, business or company to which all eels retained under this licence were disposed.
- It is the responsibility of the holder of the licence to ensure any licensed assistant fisher endorsed to fish under this licence complies with the terms and conditions of this licence.

**1.1.8** *Fishing is conducted in a manner that does not threaten stocks of by-product species.*

There are no by-product species allowed to be commercially taken in the Tasmanian freshwater eel fishery as no other fish species apart from the shortfinned and

longfinned eel are allowed to be commercially taken. Any native fish species, which is incidentally harvested with eels, are to be released immediately unharmed.

*1.1.9 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.*

The IFS believes that the current management of the freshwater eel fishery in Tasmania will achieve the above objective.

The management initiatives of the freshwater Tasmanian eel fishery include:

- Adequate protection of spawning stock biomass through closure of major rivers to commercial eel fishing (less than 1% of the State's rivers and streams are commercially fished with fyke nets).
- Good catch reporting arrangements, and management of fishery by catchments
- Annual assessment of fishery performance
- Closure of certain waters
- Creating sanctuary zones
- Adaptive management response to needs of the fishery

The methods used to uphold the management initiatives include conditions of licence, which detail how and where commercial eel fishing may be undertaken. These licences are constituted under the *Inland Fisheries Act 1995* and *Inland Fisheries Regulations 1996*, which enable the IFS to adapt conditions of licence to meet the management initiatives and needs of the fishery at any time.

### **B.1.2 Objective 2.**

**Where the fished stock(s) are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes.**

#### **B.1.2.1-2 Management responses**

*1.2.1 A precautionary recovery strategy is in place specifying management actions, or staged management responses, which are linked to reference points. The recovery strategy should apply until the stock recovers, and should aim for recovery within a specific time period appropriate to the biology of the stock.*

In order to protect eel stocks within Tasmania the following management practices have been instigated:

- less than 1% of the State’s rivers and streams are commercially fished with fyke nets,
- limited entry fishery,
- gear and fishing restrictions.

The IFS believes that protecting a significant proportion of the eel population from commercial fishing will ensure continued “silver eel” (sexually matured eels) escapement and resulting juvenile eel recruitment. Unfortunately, traditional stock assessment techniques are not possible for freshwater species such as the shortfinned and longfinned eel due to their unusual life cycles. The current management of eel stocks within Tasmania is designed to ensure that ecologically viable stock levels are maintained and in instances where natural recruitment is no longer possible enhanced.

The *Inland Fisheries Act 1995* empowers the IFS to take any action it deems necessary to protect freshwater eel stocks within Tasmania. This could include a reduction in fishing effort, closure of a particular water body and/or closure of the entire fishery.

*1.2.2 If the stock is estimated as being at or below the biological and / or effort bottom line, management responses such as a zero targeted catch, temporary fishery closure or a ‘whole of fishery’ effort or quota reduction are implemented.*

Given that less than 1% of the State’s rivers and streams are commercially fished with fyke nets which supports most of the stock responsible for spawning and recruitment to the fishery, it is highly unlikely that commercial fishing will be responsible for stock decline.

The *Inland Fisheries Act 1995* empowers the IFS to take any action it deems necessary to protect freshwater eel stocks within Tasmania. This could include a reduction in fishing effort, closure of a particular water body and/or closure of the entire fishery.

## **B.2 PRINCIPLE 2.**

**Fishing operations should be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem.**

### **B.2.1 Objective 1.**

**The fishery is conducted in a manner that does not threaten bycatch species.**

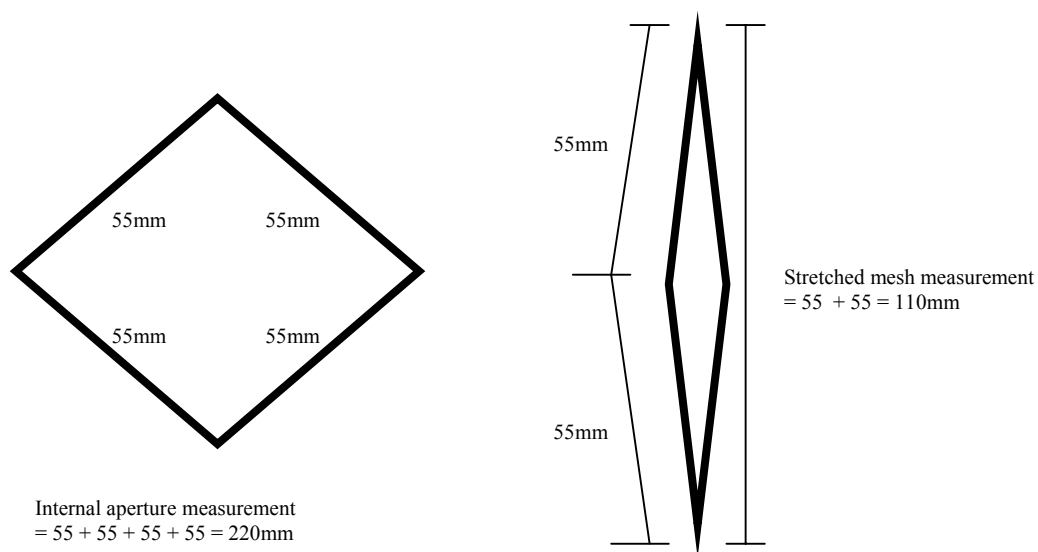
### B.2.1.1 Information requirements

#### 2.1.1 Reliable information, appropriate to the scale of the fishery, is collected on the composition and abundance of bycatch.

The recording of composition and abundance of bycatch within the commercial eel fishery is limited. Data is restricted to frequent random spot checks conducted by IFS compliance personnel, supplemented by anecdotal evidence supplied by eel fishers to IFS staff. The reporting of bycatch that is not returned live to the water is encouraged.

The IFS by way of placing licence conditions on individual licences, the closure of certain waters in conjunction with the *Inland Fisheries Act 1995 & Inland Fisheries Regulations 1996*, has sought to address bycatch by ensuring that it is minimised as much as possible. The IFS's precautionary approach to bycatch includes the following:

- Licence conditions for all commercial eel fishers stipulate that they are not to take or be in possession of any aquatic species other than eels. As such there is no targeting or benefit in capturing bycatch.
- Unless appropriate approval is obtained from the IFS, all fyke nets are to be fitted with a 220mm size aperture (110mm stretched mesh) (Figure 2) excluder screen to exclude any potential bycatch including platypus, water birds and larger salmonids. Nets exempted from excluder screens must have the cod ends raised a minimum of 300 mm above the water surface. Any bycatch species caught must be immediately released upon clearing of nets. Nets are only exempted when it is ascertained (through biological data) that the water contains a large proportion of large eels (ie >1.5 KG).



**Figure 2: Mesh Dimensions / Measurements**

- Waters that contain listed threatened, endangered or protected species as well as parts of waters that may contain significant populations of species vulnerable to capture (fish spawning habitats), are excluded from waters that may be fished by commercial eel fishers.

Elver harvesting at the Meadowbank Lake dam site is conducted wholly by IFS staff utilising a custom made trap. Bycatch in this instance is limited due to the set up of the trap, but occasional incidental catches of both lampreys and climbing galaxiias occurs.

If the catch is to be transferred around the dam wall, no grading of the catch takes place, and both eels and bycatch are released unharmed upstream. If the catch is to be moved out of the catchment, the catch is graded separating fish species from eels.

Elver (juvenile eel) harvesting at the Trevallyn site is conducted wholly by IFS staff to ensure that there is no possibility of any translocation of fish species out of their range in order to protect the State's endemic fish species. IFS staff utilise custom made fyke nets to target the elvers. Bycatch is generally limited due to the small excluder screens sewn into each net, timing of fishing and the positioning of these nets. Again the catch is graded and depending on abundance and composition of bycatch, it is either released at the site, or due to the captured species common status, are dispatched of according to animal ethics protocols.

At both locations of elver harvesting, the IFS records any bycatch species and abundance and how this bycatch is dealt with.

### ***B.2.1.2 Assessments***

#### ***2.1.2 There is a risk analysis of the bycatch with respect to its vulnerability to fishing.***

IFS in conjunction with the TPEFA and the Animal Ethics Committee that is aligned with the Department of Primary Industries, Water and Environment (DPIWE) initiated a study in early 2001, to determine the effectiveness of different sized excluder screens on fyke nets to exclude bycatch (primarily platypus but also larger salmonids - Tasmania is relatively depauperate in large native fish species)

From the results of this study, excluder screens were reduced from the then 140 mm stretched mesh size to the currently adopted 220mm size aperture (110mm stretched mesh) mesh size. This was based on the potential risk to platypuses whereby the larger mesh size may have potentially allowed juvenile platypus access to fyke nets. The reduced mesh size saw no difference in the eel catchability or eel size range for the fyke nets.

Due to the current approach by the IFS to be proactive in attempting to minimise bycatch, there is no mechanism in place to regularly collect data that could be used to conduct a risk analysis of the sustainability of the bycatch of the fishery.

### **B.2.1.3-6      *Management responses***

**2.1.3** *Measures are in place to avoid capture and mortality of bycatch species unless it is determined that the level of catch is sustainable (except in relation to endangered, threatened or protected species). Steps must be taken to develop suitable technology if none is available.*

As briefly detailed in 2.1.1 above, the IFS has by way of *the Inland Fisheries Act 1995 & Inland Fisheries Regulations 1996* in conjunction with licence conditions has attempted to reduce the incidence of bycatch being caught, and if caught, increase the chances of fish survival. These regulations and conditions include the following:

- ❑ Less than 1% of all Tasmanian rivers are open to commercial eel fishers
- ❑ All World Heritage Areas, National Parks and State Reserves are excluded from any commercial eel fishing
- ❑ Waters containing listed threatened, endangered species are excluded from waters allowed to be fished
- ❑ Fyke nets are limited in overall dimensions with minimum mesh size
- ❑ Eel traps are limited in overall dimensions with minimum mesh size
- ❑ All fyke nets are to be fitted with a 220mm size aperture (110mm stretched mesh) excluder screen unless otherwise exempted. If exempted, cod ends of the fyke nets must be raised clear of the water surface at least 300 mm.
- ❑ No commercial eel fisher or assistant when fishing, is to take or have in their possession any other aquatic species other than eels
- ❑ Fyke nets are to be cleared every 24 hours
- ❑ All bycatch is to be immediately returned to the water

The deregulation of the feeding eel fishery in 1989-90 saw a number of earlier regulations being dropped (spacing of fyke nets, proximity to river/creek/marsh outflows, distance across a creek covered by fyke net), the dropping of these regulations could be interpreted as potentially increasing the impact on bycatch species. While this could be the case if eel fishers were permitted access to waters containing species of rare or endangered conservation significance, this is not the case in Tasmanian waters.

Anecdotal evidence coupled with IFS compliance staff spot checks would suggest that the vast majority of fyke net bycatch is made up of either brown or rainbow trout species. These species have a very high survival rate within fyke nets and any mortality that does occur is considered sustainable by the IFS as both species possess healthy populations in the State and are capable of reproducing within a water body.

IFS is currently of the opinion based on Tasmania's limited diversity of populations of native fish species occurring in fyke netting regions, along with a relative high chance of survival if caught, current regulations and permit conditions in place appear to be ensuring the sustainability of these species. The IFS as governing body is always looking for improved bycatch devices/designs.

**2.1.4** *An indicator group of bycatch species is monitored.*

Due to the precautionary approach adopted by the IFS in relation to minimising commercial eel fishers bycatch, it is currently viewed by the IFS that by monitoring the eel fishers by way of frequent inspections by compliance staff, bycatch is currently being effectively monitored both visually and communicatively. Commercial eel fishers are randomly monitored by enforcement staff throughout the warmer months when fishers are targeting eels. These inspections include that fishers are complying with conditions of licence (ie equipment used, fishing locations, fish size, and bycatch).

The use of an indicator species to assess bycatch would scientifically be difficult and potentially scientifically meaningless due to the relative low commercial volumes of eels taken from Tasmanian waters along with the relative high abundance of any potential indicator species in relation to the eel population.

Potentially some of the native galaxiid species may be used as an indicator species to monitor bycatch, but these offer limited opportunities due to the majority of commercial eel fishing in Tasmania being lake based where galaxiid diversity is lower, and due also to IFS regulations, commercial eel fishing is generally restricted in impoundments where these species occurs. As such, any bycatch monitoring could not be conducted uniformly across the State.

**2.1.5** *There are decision rules that trigger additional management measures when there are significant perturbations in the indicator species numbers.*

Should an IFS inspector report any unacceptable quantities of bycatch being caught and not released alive back into the waterbody, an assessment would be made by the IFS commercial fisheries management personnel. An assessment would determine whether the bycatch was based on natural biological patterns of the caught species or whether the catch was related to positioning of gear in relation to bycatch habitat. Upon determining if the event was a ‘one off’ or there existed a high probability of an unacceptable repeat capture and mortality of bycatch, licence conditions would be reviewed to either close off certain parts of that water or impose a total closure of that water.

The *Inland Fisheries Act 1995*, enables the IFS to change or place any restrictions or conditions on a commercial eel fishers license at any time.

**2.1.6** *The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.*

As highlighted in 2.1.3, the IFS manages the Tasmanian commercial eel fishery in a precautionary approach that is deliberate in its intention to minimise bycatch.

The *Inland Fisheries Service Act 1995 & Inland Fisheries Regulations 1996* in conjunction with commercial eel fishers licensing conditions while providing the fisher every opportunity to secure commercial quantities of saleable eels, is based around ensuring the protection of Tasmania's native aquatic fauna.

The Tasmanian trout fishery is equally protected under this legislation and permitted licence conditions.

Based on the above (including 2.1.3), IFS management believes that the stated objective is currently being achieved. This conclusion is based on regular spot checks by IFS inspectors reporting any bycatch along with anecdotal evidence supplied by the commercial eel fishers.

## **B.2.2 Objective 2.**

**The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities.**

### **B.2.2.1 Information requirements**

#### **2.2.1 *Reliable information is collected on the interaction with endangered, threatened or protected species and threatened ecological communities.***

The distribution of Tasmania's endangered, threatened and protected aquatic fauna species is relatively well understood and documented. There currently exist no records or knowledge of any threatening interaction with the Tasmanian commercial eel fishery and any threatened ecological communities.

The current distribution of commercial eel fishing is well known to the IFS due to the IFS licensing of areas and specific waters along with the current commercial eel fishers logbook system that must highlight the name of the waterbody fished as well as the name of the waterbody any eels are transferred into. A copy of an eel fishers logbook is attached.

As part of the IFS's bycatch minimisation restrictions on the areas that can be commercially fished, any area that contains listed endangered or threatened species is closed to commercial eel fishing.

The exception to the above is where currently a lake based galaxiid species is currently undergoing listing status to be declared 'vulnerable' under Tasmania's *Threatened Species Protection Act 1995*. This listing is based on its limited distribution as opposed to its abundance. Upon listing of this galaxiid species, the IFS will need to reassess any bycatch of this species in light of its potential new listing, and may need to ensure accurate data is recorded by the eel fisher documenting all bycatch and its status (released unharmed or dead).

### **B.2.2.2-3 Assessments**

#### **2.2.2** *There is an assessment of the impact of the fishery on endangered, threatened or protected species.*

If the galaxiid species mentioned in 2.2.1 obtains its ‘vulnerable’ listing under Tasmania’s *Threatened Species Protection Act 1995*, the IFS will need to review the potential impact on this species in light of its potential new listing. This review would consist of an assessment of the impact of commercial eel fishing on this species.

From excluder screen studies (outlined in 2.1.2), the use of 220mm size aperture (110mm stretched mesh) mesh size excluder screens has been shown to prevent the capture of all sizes of platypus in fyke nets. All commercial eel fisher nets are to be fitted with these screens unless otherwise exempted in which case they must ensure that the cod ends are raised a minimum of 300 mm from the water surface.

If future studies or reclassification of other relevant aquatic species indicate that there is an overlap between their distribution and commercial eel fishing, an appropriate assessment looking at impacts on that species will need to be made at that time.

#### **2.2.3** *There is an assessment of the impact of the fishery on threatened ecological communities.*

If future studies or reclassification from non-threatened to threatened ecological communities occurs, and studies indicate that there is an overlap between the distribution of these communities and commercial eel fishing, an appropriate assessment looking at impacts on that community will need to be made at that time.

### **B.2.2.4-6 Management responses**

#### **2.2.4** *There are measures in place to avoid capture and/or mortality of endangered, threatened or protected species.*

From excluder screen studies (outlined in 2.1.2), the use of 220mm size aperture (110mm stretched mesh) mesh size excluder screens has been shown to prevent the capture of all sizes of platypuses in fyke nets. All commercial eel fisher nets are to be fitted with these screens unless otherwise exempted; in which case they must ensure that the cod ends are raised a minimum of 300 mm from the water surface.

A list of measures is outlined in 2.1.3 that highlights bycatch minimisation measures. These measures are relevant to all species regardless of their protection status.

*2.2.5 There are measures in place to avoid impact on threatened ecological communities.*

If future studies or reclassification from non-threatened to threatened ecological communities occurs, and studies indicate that there is an overlap between the distribution of these communities and commercial eel fishing, an appropriate assessment looking at impacts on that community will need to be made at that time.

In areas where there is a higher likelihood of containing threatened ecological communities occurring, eg World Heritage Areas, National Parks and State Reserves, these areas are excluded from any commercial eel fishing.

*2.2.6 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.*

The fishery is managed to minimise bycatch of all species (including protected species) by using excluder screens (or cod ends clear of the water if exempted), and by the enforcement of the *Inland Fisheries Act 1995 & Inland Fisheries Regulations 1996* in conjunction with licence conditions that are designed to minimise all bycatch.

By ensuring the above, the IFS management believes that the stated objective is currently being achieved.

**B.2.3 Objective 3.**

**The fishery is conducted, in a manner that minimises the impact of fishing operations on the ecosystem generally.**

**B.2.3.1 Information requirements**

*2.3.1 Information appropriate for the analysis in 2.3.2 is collated and/or collected covering the fisheries impact on the ecosystem and environment generally.*

Most commercial eel fishing in Tasmania is conducted in waters that have been man-made (ie farm dams and hydro-electric impoundment's) that have been artificially enhanced (restocked with eels).

Some commercial eel fishers translocate eels from waters that receive natural recruitment to those waters that receive no natural recruitment. This may have an effect on the ecosystems within these waters, although before these waters were dammed or regulated freshwater eels would have been able to recruit into them. The Inland Fisheries Service (IFS) has developed a Risk Management Protocol (RMP) to ensure the risk of translocation of other species is reduced to an acceptable level. A copy of the RMP is attached.

No information is being collected specifically to quantify the impact of the eel fishery in Tasmania on the ecosystem and environment generally. There is not a great deal of information to quantify the impact of the eel fishery in Tasmania due to the small size of the fishery and the suspected low impact it has on the environment in general.

### **B.2.3            *Assessment***

**2.3.2** *Information is collected and a risk analysis, appropriate to the scale of the fishery and its potential impacts, is conducted into the susceptibility of each of the following ecosystem components to the fishery.*

*1. Impacts on ecological communities*

- *Benthic communities*
- *Ecologically related, associated or dependent species*
- *Water column communities*

*2. Impacts on food chains*

- *Structure*
- *Productivity/flows*

*3. Impacts on the physical environment*

- *Physical habitat*
- *Water quality*

*Impacts on ecological communities*

- *Benthic communities*

All commercial eel fishing equipment used in Tasmania is of a passive nature. The potential impacts on benthic communities where commercial fishing occurs is considered to be negligible.

- *Ecologically related, associated or dependent species*

At present there is not a great deal of information available on the ecological impacts of commercial eel fishing in Tasmania. Ecological impact is ultimately dependant upon the biological communities present in any given water body and the fishing practices of individual fishers.

- *Water column communities*

The impact of commercial eel fishing on water column communities is considered to be negligible.

*Impacts on food chains*

- *Structure*

Before the introduction of trout to Tasmania freshwater eels were the top predatory and scavenger species found in the State. Harvesting eels may have an effect on the food chain, although very large natural recruitment of eels is known to occur annually in Tasmania (Tasmania has the largest known juvenile eel resource in Australia). If an imbalance was to occur it is believed that trout could adequately cover this imbalance until more eels are recruited into the particular water body.

- *Productivity/flows*

Productivity flows may be impacted in the short term through the removal of adult eels; these waters are replenished with eels through natural recruitment. Those waters which commercial eel fishers choose to restock with juvenile eels (above man-made impoundments) are replenished so that any drop in production is balanced.

*Impacts on the physical environment*

- *Physical habitat*

Some impacts on aquatic macrophytes, erosion of banks, and/or disturbance of the benthic environment, may occur through the use of small boats, however consideration for the surrounding environment by the fishers generally minimises any significant impact by fishers (it is not in the commercial eel fishers best interest to adversely affect the surrounds where they actively fish). Gear used is passive, set fyke nets. Active fishing (eg trawling) does not occur in the fishery, thus impacts on the physical habitat is minimal.

- *Water quality*

No known impacts, other than what may expected through the use of small boats, outboard motors etc., considered minimal.

Commercial eel fishing can have positive impacts on the ecosystem including the mandatory removal by eel fishers, of all undesirable introduced bycatch fish species including redfin perch, tench and carp which pose serious threats to Tasmania's endemic fish species.

**B.2.3.3-5**      *Management responses*

*2.3.3 Management actions are in place to ensure significant damage to ecosystems does not arise from the impacts described in 2.3.1.*

The Tasmanian eel fishery is managed under the “Precautionary Principle” approach and limits commercial eel fishing activities to clearly defined reaches of a limited number of waters, using closely regulated gear which is passive and operated in such a way as to have minimum ecological impact. The *Inland Fisheries Act 1995 & Inland Fisheries Regulations 1996* enable management decisions to be made to reduce and/or avoid damage to ecosystems by minimising impacts.

*2.3.4 There are decision rules that trigger further management responses when monitoring detects impacts on selected ecosystem indicators beyond a predetermined level, or where action is indicated by application of the precautionary approach.*

As mentioned above, the Tasmanian eel fishery is managed under the “Precautionary Principle” with operational aspects of the fishery considered to have little impact on the ecosystem. The main area of concern with the operation of the fishery is the bycatch of threatened, endangered or protected species, such as platypuses or endangered fish species. Such impacts are managed through regulation on fishing equipment and practices. The surveillance of eel fishing activities by compliance staff will help provide further opportunities for independent monitoring of the fishery. Compliance officers and management actions taken accordingly will report any negative impacts on the ecosystem through the operation of the eel fishery.

*2.3.5 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective*

As mentioned above, the Tasmanian eel fishery is managed under the “Precautionary Principle” to management, this limits commercial eel fishing activities to clearly defined reaches of a limited number of waters, using closely regulated gear which is passive and operated in such a way as to have minimum ecological impact. It is considered that the fishery is conducted, in a manner that minimises the impact of fishing operations on the ecosystem generally, and that the management response will continue to achieve this objective.

## C REFERENCES

- Aoyama, J., N. Mochioka, T. Otake, S. Ishikawa, Y. Kawakami, P. Castle, M. Nishida and K. Tsukamoto** (1999). Distribution and dispersal of anguillid leptocephali in the western Pacific Ocean revealed by molecular analysis. *Marine Ecology-Progress Series* 188: 193-200.
- Castle, P.H.J.** (1963) Anguillid leptocephali in the southwest Pacific. *Zoology Publications from Victoria University of Wellington* 33, 1-14.
- Inland Fisheries Commission** (1968). *Report for year ending 30 June 1968*. Tasmania, Hobart.
- Jellyman, D. J.** (1987). Review of the marine life history of Australasian temperate species of *Anguilla*. In: *Common-Strategies-Of-Anadromous-And-Catadromous-Fishes-Proceedings-Of-An-International-Symposium-Held-In-Boston,-Massachusetts,-USA,-March-9-13,-1986* (ed. by M.J. Dadswell, R.J. Klauda, C.M. Moffitt, R.L. Saunders, R.A. Rulifson and J.E. Cooper), pp. 276-285.
- Schmidt, J.** (1925) The breeding places of the eel. *Smithsonian Report for 1924.*, 279-317.
- Tesch, F.-W.** (1977) *The Eel. Biology and Management of Anguillid Eels*. Chapman and Hall, London. 434 pp.

## PROTOCOLS FOR FISHERS TRANSFERRING EELS

All commercial eel fishers are endorsed to transfer eels over 300mm in length to other **private water bodies** from where they were caught up until 30 August 2004. This process is to comply with the **National Policy for the Translocation of Live Aquatic Organisms 1999**.

It is the responsibility of all fishers to ensure that all aquatic flora and fauna is removed from any eels transferred into **private waters**.

### **Risk Management Protocol:**

1. Visual Inspections – ensure that there are no species of fauna or flora contained within the eels to be transferred.

**Two of the following three methods are to be followed before transferring eels.**

- Dry Transfer – ensure no incidental bycatch survive the transit to the transfer site.
- Hold and grade – hold eels in tanks to ensure that all fauna and flora are removed from the eels.
- Bathing treatment – bathe the catch so that all flora and fauna is eliminated (ie salt baths). The specific gravity of sea water is 1.028 SPG (35 parts per thousand). This can be easily measured using a hydrometer or adding 35 grams of sea salt to every 1000 millilitres (1 litre) of freshwater.

Fishers are to ensure that method one is followed and at least two of the following three methods are followed when transferring eels between **private waters** within and between licensed areas.

All holding bags are to be thoroughly cleaned and dried at the end of each days transferring before being utilised to transfer eels again. Particular attention is to be paid to the removal of any aquatic plants.

